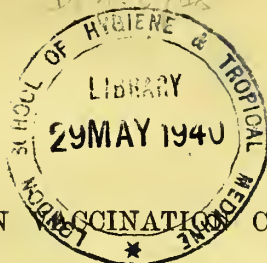


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THE GERMAN VACCINATION COMMISSION.

By E. J. EDWARDES, M.D. (LOND.), M.R.C.P. (LOND.).

(Read: Dec. 9th, 1885.)

THE object of this paper is to give a summary of the Report of the German Vaccination Commission of 1884, and of the statistics which accompany it. The following letter, by the Imperial Chancellor's representative, which is prefixed to the Report, explains why the Commission was appointed.

[COPY.]

"BERLIN, January 9th, 1885.

"The opinion formed during the carrying out of the Vaccination Law of April 9, 1874, that vaccination is at times attended with danger to the health of the individual vaccinated, has already for several years induced a closer observation of the circumstances which cause these injurious effects, and of means for warding them off. The investigations carried on in the Imperial Board of Health Office plainly show that the fault lay partly in the selected lymph, in particular the human vaccine lymph hitherto chiefly used, and partly in the neglect of necessary precautions by the vaccinators. The Imperial Board of Health, therefore, entered into a closer examination of the questions of the introduction of animal lymph into universal use, and of the institution of a systematic supervision of the work done by public vaccinators. Moreover, the Petitions Committee of the Reichstag, in its deliberations upon the petitions before it for the abolition of compulsory vaccination, repeatedly expressed itself in a similar sense.

"The lesser preservability and lesser certainty of effect of animal as compared with human lymph constituted an impediment to its general introduction. Later on, the Imperial Board of Health learnt that measures for overcoming these objections had been discovered. These measures were tried, and the favourable results which were obtained made feasible the general use of animal lymph. From the importance of the subject, however, it seemed desirable to lay the whole question (together with the scheme for the institution of an efficient supervision of the results of public vaccination) before a committee of experts.

"Meanwhile, the Reichstag, in its discussion on the petitions against compulsory vaccination on June 6, 1883, expressed its desire that the present physiological and pathological status of the vaccination question, more especially as regards the precautions fitted to ensure the greatest possible security to the health of the vaccinated individual, should be referred to a committee of experts in the subject; and that they should draw up a code of rules aiming at such security, with the eventual general use of animal lymph. They were, moreover, to arrange for the institution of a useful small-pox statistic, on the basis of obligatory returns, for the respective departments of the empire. The task before the Commission was increased.

"The Commission was composed of delegates from the Imperial States chiefly concerned, and by the addition of three anti-vaccinators versed

in the subject, care was taken that the statements of those opposed to vaccination should be fairly heard, so far at least as those statements rested on scientific grounds.

"In the course of its deliberation in the Imperial Health Office, Berlin, October 30 to November 5 of last year, the Commission arrived at the conclusions which I have the honour to present to you (the Bundesrath), with accompanying papers.

"The Report comprises, therefore—

"I. The protocol of the Commission, which includes:—1, List of agenda laid before the Commission; 2, Memorandum on the necessity of introducing animal lymph into general use; 3, Tables showing the effect of the Vaccination Law (with charts); 4, Summary of deaths from small-pox in Germany from 1875 to 1881, with two maps; 5, Two maps, showing the extent of the use of animal lymph in 1879 and in 1882.

"II. Vaccination statistics for the Empire, for 1882, with summary from 1876.

"VON BOETTICHER,

"For the Imperial Chancellor."

The Commission numbered eighteen, all of whom, the President excepted, belonged to the medical profession. Their names were as follows:—Herr Köhler (President), of the Home Office, Berlin; Dr. Koch, of the Imperial Health Office, Berlin; Dr. von Scheel, of the Statistical Office, Berlin; Dr. Eulenburg, of the Prussian Medical Ministry, Berlin; Dr. Pistor, of the Police Presidency, Berlin; Dr. Grossheim, of the Prussian War Ministry, Berlin; Dr. Kranz, Central Public Vaccinator, Munich; Dr. Siegel, Medical Councillor, Leipsig; Dr. von Kerchensteiner, of the Bavarian Ministry, Munich; Dr. von Koch, of the Würtemberg Medical College, Stuttgart; Dr. Arnsperger, of the Grand-Ducal Baden Ministry, Carlsruhe; Dr. Reissner, of the Grand-Ducal Hesse Ministry, Darmstadt; Dr. Thierfelder, of the Grand-Ducal Mecklenb.-Schwerin Ministry, Rostock; Dr. von Conta, of the Saxony Ministry, Weimar; Dr. Krieger, Sanitary Councillor, Strasburg; Dr. Boeing, physician in practice, Uerdingen; Dr. Weber, physician in practice, Cologne; Dr. Betz, physician in practice, Heilbronn. Of these, Dr. Pistor was absent all through, owing to illness. The three last named were opposed to compulsory vaccination, Dr. Betz being opposed to vaccination in any shape. Dr. Boeing was a public vaccinator himself.

Eight agenda, drawn up in the Imperial Board of Health, were presented to the Commission for deliberation, and as a basis to go upon. The first and most important consisted of eight questions. The following are the conclusions arrived at by the Commission, in nine sets.

CONCLUSIONS OF THE COMMISSION.

I.—*Conclusions respecting the present Physiological and Pathological Status of Vaccination.*

1. With rare exceptions, one survived attack of small-pox confers immunity against subsequent attacks (voted by 12 v. 3; 2 abstaining).

2. Vaccination exerts a similar protection (voted by 12 v. 2; 2 abstaining).

3. The duration of the protection afforded by vaccination varies within wide limits, but is on the average ten years.

4. At least two well-developed vaccine vesicles are necessary to ensure an efficient protection.

5. Revaccination is necessary ten years after primary vaccination.

6. The vaccinated condition of the community increases the relative protection against small-pox acquired by the individual by vaccination, and hence vaccination is beneficial, not only individually but generally (12 v. 1; 2 abstaining).

7. Vaccination may have an injurious effect, under certain circumstances. In the use of human lymph, the danger of transferring syphilis, although extremely slight, cannot be entirely excluded. Any other bad effects are apparently due only to accidental wound-diseases (all, except 3 abstaining).

All these dangers may, by precautions in the performance of vaccination, be reduced to such a minimum as to make the benefit of vaccination infinitely outweigh any possible injurious effects (all, except 3 abstaining).

8. Since the introduction of vaccination, no scientifically provable increase of any particular disease or of the general mortality has occurred, such as might be looked upon as a consequence of vaccination (all, except 1 abstaining).

II.—*Conclusions on the Introduction of Animal Lymph into General Use.*

1. Since the dangers to health and life (vaccination-syphilis, vaccination-erysipelas, etc.), occasionally connected with the use of human lymph, can be avoided by the use of animal lymph, so far as any direct transference of syphilis or of accidental wound-diseases is concerned, and since vaccination with animal lymph has been recently so perfected as almost to equal vaccination with human lymph, the latter is to be superseded by animal lymph.

2. This is to be effected gradually, and (by the aid of experience already gained) institutions are to be established

for the provision of sufficient animal lymph. When its supply is thus secured, public vaccinations are to be performed with such lymph.

3. The following are to be the guiding principles of such institutions: (*a*) each one is to be under medical superintendence; (*b*) lymph will be supplied gratis and post free to public vaccinators; (*c*) it will be permissible to use "retrovaccine", in place of the so-called genuine vaccine-lymph; (*d*) lymph is not to be sent out to vaccinators until the previous health of the animal yielding it has been shown to be good, by a *post-mortem* examination (after slaughtering); (*e*) special instructions will be given as to the age and mode of rearing of the calves, the time and manner of removing the lymph, its preservation, sending out, etc., by a special committee.

III.—*Instructions to Public Vaccinators.*—A. *General.*

§ 1. In places where infectious diseases extensively prevail, such as scarlatina, measles, diphtheria, croup, whooping-cough, typhus (exanthematous), or erysipelas, public vaccinations are not to take place while the epidemic lasts. If the public vaccinator only first hears of such epidemic after beginning the vaccinations, or even if only individual cases of erysipelas arise, he must at once discontinue the vaccinations in that place, and report accordingly. If the public vaccinator is himself treating any cases of infectious disease, he must equally guard against their extension through his own person, in the exercise of his vaccination duties.

§ 2. In the announcements of public vaccinations, care is to be taken that the parents of the children receive printed instructions as to the public vaccinations, and as to the treatment of the vaccinated during the development of the pustules.

§ 3. The public vaccinator, with the assistance of the local police, will take care that the appointed place is not overcrowded, and is sufficiently ventilated. The presence together of subjects for primary vaccination and for revaccination must be most carefully avoided.

B. *Obtaining Lymph.*—1. *Human Lymph.*

§ 4. Until vaccination with animal lymph becomes general, vaccinators will obtain the necessary lymph to begin the vaccination with from the vaccine institutions of their respective States. Lymph for continuing the vaccinations, or for disposal to other medical men, they must obtain for themselves from fit subjects.

§ 5. The child from whom lymph is to be taken must be examined over the entire body, and must be perfectly healthy and well nourished. It must be the child of parents who do not suffer from hereditary disease; and, in particular, the children of mothers who have aborted or have had premature deliveries must not be chosen. The child furnishing lymph should be at least six months old, born in wedlock, and not the first child of the parents. Only exceptionally may these rules be deviated from, if there is not the slightest doubt about the parents' health. The child must be free from ulcers, fissures, and eruptions of every kind, from condylomata on the vascular regions,—lips, arms, and navel,—from glandular swellings, from chronic affections of the nose, eyes, and ears, and must bear no signs of syphilis, scrofula, rickets, or any other constitutional disease.

§ 6. Lymph from revaccinated persons may only be used in cases of necessity, and never for primary vaccination. The health must be seen to, as above detailed.

§ 7. Every vaccinator must indicate the source and date of his lymph, especially when obtained by himself, or to be sent to others. The lymph itself is to be so labelled that no doubt can arise as to its source, and these indications must be preserved for one calendar year.

§ 8. Lymph must never be obtained from any child later than the day-week after vaccination. The vesicles supplying it must be ripe and uninjured, and their bases must be only slightly inflamed. Vesicles which have begun to be erysipelatous must in no case be used. At least two vesicles must be left untouched.

§ 9. The vesicles are to be opened either by punctures or small incisions; squeezing the vesicles, or pressing their neighbourhood to obtain more lymph, must not be done.

§ 10. Only such lymph may be used as exudes of itself, and which to the naked eye contains neither blood nor pus. Bad-smelling or very liquid lymph is to be avoided.

§ 11. Only the purest glycerine must be mixed with the lymph. The mixture must be effected by means of a clean glass rod.

2. *Animal Lymph.*

§ 12. As soon as animal lymph is brought into general use, the vaccinators will obtain all their lymph-supply from the State institutions.

§ 13. The above directions in § 7, § 10 (second part), and § 11 will apply here. Special instructions will be issued as to the obtaining of animal lymph.

C. Preservation of Lymph.

§ 14. Liquid lymph is to be kept in clean, hermetically-closed capillary tubes, or in glass vessels, holding from one to two cubic centimètres. Dry lymph may be kept on glass slips, or in glass vessels, or on ivory-, whalebone-, or horn-points. No articles used in preserving lymph should be used a second time, except after thorough cleaning and disinfection (best by boiling in water).

§ 15. Lymph should be protected from a freezing temperature, and from a heat of more than 50° C. (120° F.)

D. Vaccination and Revaccination.

§ 16. It is recommended not to vaccinate infants until they have passed the age of three months. Children suffering from severe acute or chronic diseases, much affecting their nutrition, should not be vaccinated, nor revaccinated. Exceptions are permitted (especially during epidemic small-pox), and these will be left to the judgment of the vaccinating surgeon.

§ 17. The instruments for vaccination must be clean, and before every fresh vaccination must be cleansed with water and dried. In drying them, handkerchiefs and the like must not be used, but carbolised or salicylised wool. No instruments should be employed which cannot be thoroughly cleaned. Instruments used in vaccination must not be used for any other purpose.

§ 18. The moistening of dry lymph is to be done with pure water or glycerine, or a mixture of these.

§ 19. As a rule, vaccination will be performed on the upper part of the arm. In primary vaccination, from three to five superficial incisions of at least one centimètre long, or as many superficial punctures, may suffice, on each arm; in revaccination, from five to eight superficial incisions, or punctures, on one arm. Much bleeding is to be avoided in vaccination. Lymph must not be applied with a brush.

§ 20. Primary vaccination may be considered successful if there are at least two well-developed vesicles. If there is only one such vesicle, auto-revaccination, or another vaccination, must be performed at once; but the vaccination certificate must be given all the same.

In revaccination, the formation of papules or small vesicles at the site of the operation, is enough for success.

E. Private Vaccinations.

§ 21. All the above directions are to be in force here also, except §§ 1, 2, 3, 4, relating to public vaccinations exclusively.

IV.—*Instructions to the Parents or Guardians of Children to be Vaccinated.*

§ 1. Children must not be brought to the place of vaccination from any house in which there is an infectious disease, such as scarlatina, measles, diphtheria, croup, whooping-cough, or small-pox.

§ 2. The children must be brought for vaccination with washed bodies, and in clean clothes.

§ 3. Also, after vaccination, it is most important to keep the child as clean as possible.

§ 4. If the child cannot have a daily bath, it should at least be washed daily.

§ 5. The child may be fed as usual.

§ 6. In favourable weather the child may go into the open air; but in midsummer, the hottest part of the day and the direct rays of the sun should be avoided.

§ 7. The vaccination-places should be preserved with the greatest care from being rubbed, scratched, or rendered dirty. The sleeves must be of such a size as not to irritate them.

§ 8. When the vaccination is successful, small vesicles begin to form after the fourth day, which, as a rule, increase up to the ninth day, the child being slightly feverish, and thus develop to elevated pocks, surrounded by an inflammatory zone. They contain a clear fluid, which begins to be turbid on the eighth day. From the tenth to the twelfth day the pocks begin to dry up and form scabs, which fall off of themselves after from three to four weeks. The removal of lymph for further vaccination is painless, and does the child no harm.

§ 9. In the regular course of the vaccination-pocks, no dressing is required; but if a marked and wide redness appears immediately around them, or if the pocks open of themselves, the arm is to be covered with a piece of linen soaked in olive oil, or still better, smeared with vaseline. If any considerable sickness set in after vaccination, a medical man is to be called in.

§ 10. The vaccinated children will appear at the place of vaccination on the appointed day for inspection. If the vaccination is successful, the parents will then receive a certificate to that effect, which is to be carefully preserved.

§ 11. If the child cannot be taken for inspection on account of illness, or the presence of infectious disease in the house, the parents must report the same to the public vaccinator, on the day of inspection at latest.

V.—*Instructions to Local Authorities regarding Public Vaccinations.*

§ 1. Public vaccinations are not to be held in any place where infectious diseases widely prevail, such as scarlatina, measles, diphtheria, croup, whooping-cough, exanthematous typhus, or erysipelas. Children shall not be brought for vaccination from any house in which any of the above diseases exist; moreover, adults belonging to such houses must keep away from the place of vaccination. The vaccination and inspection of children belonging to such houses must take place separately from other children. The same rule will apply when small-pox occurs in any house.

§ 2. For the public vaccination rooms are to be provided sufficiently large, properly ventilated and cleaned, and capable of being warmed, which will allow, wherever possible, a separation of the waiting- from the operation-room. In cold weather the rooms are to be warmed.

§ 3. A representative of the local police will be present during public vaccinations, to assist in the preservation of order. Writing materials are to be provided. During revaccinations and the subsequent inspections, a teacher is to be present.

§ 4. Overcrowding of the rooms, especially of the operation-room, is to be avoided. The number of children directed to appear will be in proportion to the size of the rooms.

§ 5. The presence together of children for vaccination and children for inspection must be prevented. In every case children for primary vaccination must be kept as separate as possible from children for revaccination (school-children).

§ 6. It is to be seen that the children come to the places of vaccination washed and in clean clothes. Children unsatisfactory in this respect may be sent away from the place of vaccination.

VI.—*Conclusions as to securing a proper Selection of Public Vaccinators.*

1. Public vaccinators are to be appointed by the authorities of the province.

2. Public vaccination is to be preferably assigned to the district medical officers.

3. The official title, "Vaccinating Surgeon", will follow the assumption of the duties.

4. The remuneration of the "Vaccinating Surgeon" (public vaccinator) will require the sanction of the authorities of the Department.

VII.—*Conclusions as to the Technical Preparation of Surgeons for Vaccination.*

1. On this subject the following rules will be in force:—
(a) The clinical instruction of students is to embrace instruction in vaccination. (b) Moreover, every surgeon who is about to vaccinate, either privately or publicly, must produce proof that he has attended two public vaccinations and two public revaccinations, and that he has acquired the necessary knowledge as to obtaining and procuring vaccine lymph.

2. In medical examinations, a knowledge of vaccination, both technical and general, is to be required.

VIII.—*Conclusions as to the Institution of a Permanent Technical Supervision, by Medical Officials, of Public Vaccination.*

1. The supervision of public vaccination will belong to the next superior of the Medical Officers of the Department (under the supposition that the public vaccinators themselves are for the most part medical officers).

2. This supervision will consist in an inspection of one or more public vaccinations at the appointed place and time.

3. Every public vaccinator must undergo an inspection at least every three years.

4. The technicalities of vaccination will form the chief subject of inspection; and next, the drawing up of the lists, the selection of the place for vaccination, the number of children, etc.

5. Private vaccinations are also to be subjected to examination, in so far as they are not done by the family doctor, in the family.

6. A technical supervision of vaccination institutions—in particular, both public and private institutions for the supply of animal lymph—is also to be carried out by periodical inspections.

7. The attention of the vaccination authorities must also be extended to the trade in vaccine lymph.

IX.—*Conclusions respecting the framing of a Small-pox Statistic.*

1. Within eight days after every death from small-pox, a certificate is to be filled up by the Medical Officers appointed by the Departmental Authority, which certificate must contain the particulars indicated in the annexed form. To ensure the carrying out of this, a co-operation of the medical and non-medical officials of the affected district is recommended.

Within a further period, to be determined by the same Authority, the certificate is to be forwarded to the statistical centre of the State, or other appointed place, for collection, verification, and statistical compilation.

2. All the certificates for the previous year, up to March 1st, every year, are to be sent from the different States to the Imperial Health Officer. At the same time a summary is to be sent, giving the calculated population at the beginning of the year of those towns having 20,000 or more inhabitants, in age-classes of ten years, for each sex. In so far as no better data are available for this, the average yearly increase or decrease of the population, as yielded by the last census, may be taken for the years after the last census, both as regards the whole population, and the age-classes in each sex.

Form of Certificate for Cases of Small-pox.

Commonalty.....
 Administrative district.....
 State.....
 Street..... No. (or indication)
 Christian and surnames of deceased.....
 Sex—Male—Female. (Underline the indicated sex.)
 Day, month, and year of birth
 Occupation. (In case the deceased did not gain his or her own living, or was not independent—*e.g.*, married women without special occupation; children, etc.—give the occupation of the head of the family.).....

 Remark whether deceased was regularly employed away from home in any factory or workshop, and if so, of what kind; or attended school

 Day, month, and year of death
 Place and date.....
 Signature.....

The eight conclusions forming the first set were answers to eight queries propounded to the Commission. I will now take these in order; the remaining conclusions, except those on the adoption of calf-lymph, are of less interest.

Query 1: Does one attack of small-pox, when survived, confer protection against subsequent attacks?

Koch regarded it as almost superfluous to say that it was generally recognised that all acute infectious diseases conferred immunity against future attacks of the same disease. This protection was by no means an absolute one, *e.g.*, measles occasionally attacked the same individual even three times. But second attacks of small-pox were certainly rare. Bousquet had given 34 in 16,051 cases from 30 epidemics, while Siegel gave 26 out of 3,188 cases from the Leipsig epidemic

of 1871. Boeing's alleged relapses in Aachen, within a few weeks after the first attack, probably rested on diagnostic error. Reissner, out of more than 700 observed cases of small-pox since 1873, found only one case of a second attack, the patient stating that he had had small-pox forty years before. In the great epidemic, out of at least 12,000 cases in South Germany, no second attack had occurred. Reissner also pointed out the curious fact, that in former times all cases of second attacks had been stated as having occurred in children or young persons, never in adults: this pointed to error in diagnosis. Dr. Grossheim, of the War Office, out of 22,641 cases treated in the military hospitals of Germany during the war, had found hardly one alleged attack. One case certainly had excited great interest,—a man had a light form of variola three months after the first attack. Von Kerchensteiner, of Bavaria, had never heard of early second attacks; any such occurred only many years after the first attack. He himself had seen a third attack; Helva, of Vienna, had attended the patient in the first two attacks; he died in the third. Krieger had seen only one certain second attack out of 500 observed cases; two more were doubtful. Thierfelder had seen two second attacks of measles a fortnight after the first attacks, so that an *early* second attack of small-pox was theoretically possible; but he had never heard of nor seen one. Von Koch had met with only two second attacks in Stuttgart: both were fatal; in each case, the second attack after a long interval of time from the first. Siegel said that Wunderlich found 22 second attacks in 1,727 cases in Leipzig, 1871, and six of the 22 were fatal. One of these cases was given by Wunderlich, a reliable and exact observer, as the case of a person who had already had small-pox in the same epidemic. This was a positively observed case of an *early* second attack of small-pox; but the fact that one such case in medical literature excited such interest, showed that it was a very rare exception, and therefore proved the general rule, that small-pox confers immunity against itself.

Koch incidentally, in answer to Boeing's argument that the change of small-pox from a children's to an adult's disease in this century was owing to improved veterinary legislation and improved social condition, remarked that the anti-vaccinationists were very fond of assuming the identity of sheep-pox with small-pox. The two diseases had nothing to do with each other; their epidemics were never simultaneous, nor even quickly followed each other; further, he had always failed, in abundant experiments, to communicate small-pox to sheep by inoculation, or sheep-pox to man (*viz.*, himself).

The chief members of the veterinary profession were all on his side. In answer to a mistaken notion of Weber's about the law on ovination, Koch explained that inoculation of man with small-pox was forbidden early in the century, but that ovination—inoculation of sheep with sheep-pox—was only forbidden a few years ago.

Query 2: Does vaccination confer a similar protection; and is the diminution of small-pox since the beginning of the century to be ascribed to the introduction of vaccination, or to other causes?

This query was the centre round which circled the chief interest of the debates; its discussion occupies eighty-four pages of the Report. Several statistical compilations were brought forward on this subject; those of the Board of Health I will give in full.

The Board of Health Statistics.

Dr. Koch explained that these official statistics had been compiled with the sole object of showing the effect of the compulsory revaccination law of 1874. For these statistics he had taken the small-pox mortality as the only reliable basis to go upon.

It was well known that the mortality from all diseases was much greater during infancy than in the years next succeeding it, and that all small-pox statistics ought to be arranged in age-classes, considering the great influence of age upon morbidity, lethality, and mortality. (By lethality is meant the degree of reaction of the organism towards an infectious disease.) Now, although some statistics in age-classes appear to show that vaccination is useless, this was only because the same statistics brought in the "vaccinated condition" of the patients. But all comparative statistics founded on this last were *ipso facto* unreliable, "usually worthless". Directly the question of the vaccination or non-vaccination arose, room was made for a number of errors; in fact, this was why the original returns of the epidemic were not produced. To begin with, the information as to whether anyone who had died of small-pox had been vaccinated or not, had been given by the deceased's friends, *and not* (in the majority of instances) *by medical men*. Again, such statistics did not state (1) whether the vaccination was successful or not; (2) the degree of success—the number of vesicles produced; (3) the date of the vaccination. This was most important, for they were all agreed that vaccination did not protect indefinitely; and it was a very different thing to him whether a man had been vaccinated five years previously, or fifty years previously.

CHART I.—PRUSSIA.—DEATHS FROM SMALL-POX PER 100,000 OF THE POPULATION.

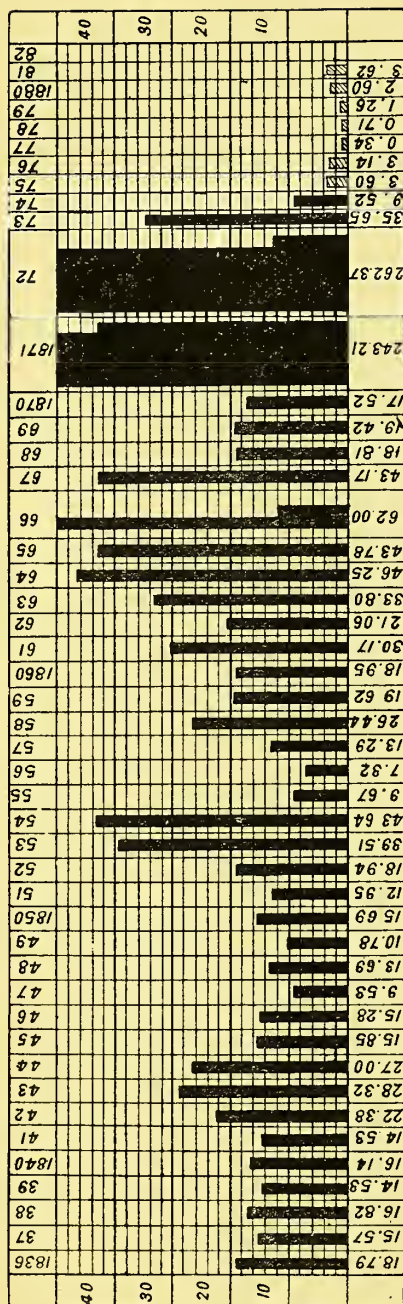
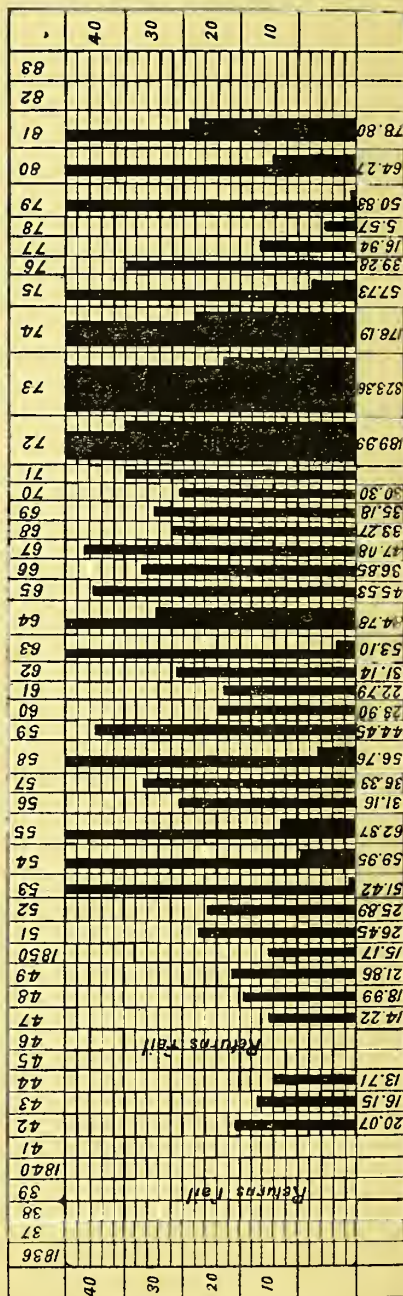


CHART II.—AUSTRIA.—DEATHS FROM SMALL-POX PER 100,000 OF THE POPULATION.



As to the patients' friends, they always leaned to an affirmative reply. But lastly, even if they had all this information accurately given, they would require to know, in order to satisfy the demands of such a statistic, besides the proportion of the vaccinated to the unvaccinated (at different ages) amongst those who died of small-pox, *the same proportion amongst the living population*. Now this knowledge it was impossible to obtain, and even if obtained for one day, it would not hold good for the next day, so shifting were the conditions as regards population.

The mortality from small-pox was the only secure basis; if this ever erred, it was on the side of excess. Von Scheel supported this by the examples of 1881 and 1882. The small-pox deaths returned to the Imperial Statistical Office were 1,473 in 1881, and 1,330 in 1882; but on verification, these numbers were reduced to 979 and 957—*i.e.*, 66 per cent. and 75 per cent. respectively. This excess was an error which told not against the Vaccination Law, but for it, because it was more appreciable in proportion to the much fewer deaths after the law than before it—*i.e.*, the true numbers would contrast still more strongly. The error was never the other way; no small-pox deaths were returned as due to other diseases.

Such being the case with regard to statistics, Koch argued that all the greater importance attached to *personal experience*; and this he relied upon to a great extent. He had seen much small-pox, and had vaccinated and revaccinated thousands, and had arrived at the profound conviction that vaccination did protect. His own personal experience might not be thought worth much, but when it was corroborated by the vast personal experience of experts at home in the subject, it became important. In other medical questions it was allowed its full weight, why not here?

Prussia.

First, the small-pox mortality of Prussia since 1874 is compared with that of Prussia before 1874 (when compulsory revaccination began). The deaths per 100,000 of population from 1816 to 1872 are as follows:—

1816-30=45, 27, 29, 20, 10, 17, 20, 19, 14, 15, 14, 25, 19, 19, 24.
 1831-50=11, 30, 60, 48, 27, 18, 15, 16, 14, 16, 14, 22, 28, 27, 15, 15, 9, 13,
 10, 15
 1851-70=12, 18, 39, 43, 9, 7, 13, 26, 19, 18, 30, 21, 33, 46, 43, 62, 43, 18,
 19, 17
 1871-72=243 and 262, respectively. (The years of the great epidemic.)
 1873-74=35, 9. A marked decline, as usual after epidemics.
 1875-82=3.6, 3.1, 0.3, 0.7, 1.2, 2.9, 3.6, and 3.6.

Thus the mortality, instead of rising, sinks to and remains at lower figures than have ever been exhibited as far back as any records go.

Austria.

Next, Prussia is compared with Austria, a similar country. The small-pox deaths per 100,000 population in Austria are as follows :—

1842-44=20, 16, 13.

1845-46. Data are wanting.

1847-60=14, 18, 21, 15, 26, 25, 51, 59, 62, 31, 36, 56, 44, 23.

1861-71=22, 31, 53, 84, 45, 36, 47, 33, 35, 30, 39.

1872-74=189, 323, 178. The epidemic.

1875-76=57 and 39. The usual decline.

1877-81=53, 60, 50, 64, and 82.

Now the Austrian epidemic was the severer of the two, and affected the susceptible portion of the population even more than in Prussia; and yet, after a decline of only two years, the mortality leaps to its usual figures, such as occurred before the epidemic, and even higher. Why this immense difference in the behaviour of the small-pox mortality after 1875? There were no changes in the veterinary legislation or the social conditions to account for it. *The only difference between the two countries is*, that in Prussia re-vaccination was made compulsory in 1874, and to this alone, therefore, can the difference be due.

Cities, German and Foreign.

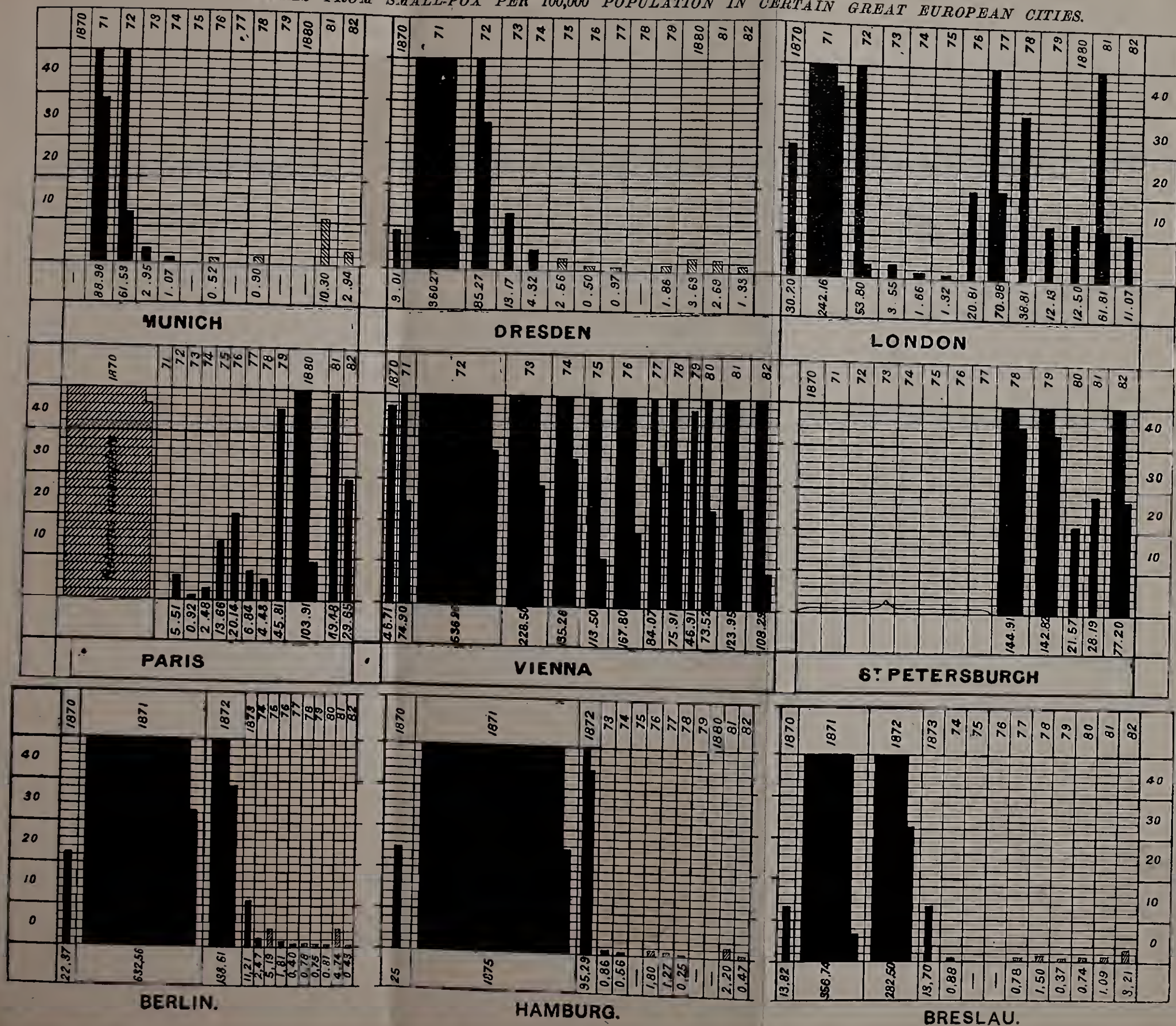
Thirdly, five German cities are compared with five foreign cities before and after the introduction of compulsory re-vaccination in the former. In regard to this comparison, Boeving fought hard to maintain that it was unfair to compare Berlin with London, because London possessed very stringent compulsory vaccination. But Koch explained, to Boeving's own satisfaction at last, that by the term "compulsory vaccination" in the Tables was meant the compulsory vaccination ordained by the German law, and that is a *compulsion to vaccination and revaccination*—and this existed in no other country than Germany.

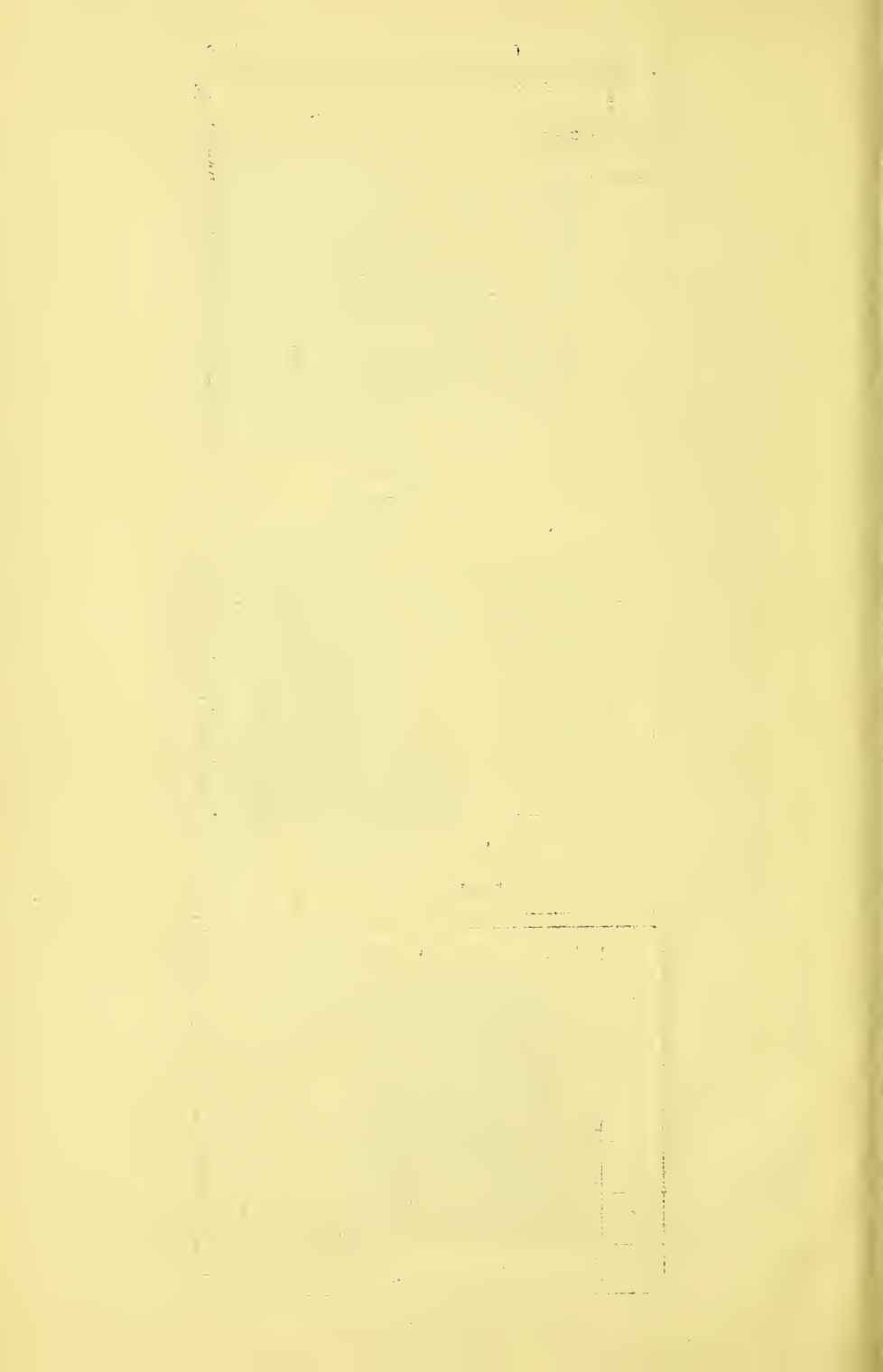
As is said in the text accompanying the following Table (see opposite page), "nothing can show the influence of the Vaccination Law better than the contrast between such cities as, *e.g.*, Berlin and London, or Dresden and Prague."

The Armies.

Lastly, the German, or rather the Prussian army, is compared with the French and Austrian armies before and after 1874. I have added the British army. "Like the general populations of the different countries, the armies suffered severely from the great epidemic of small-pox in

CHART V.—DEATHS FROM SMALL-POX PER 100,000 POPULATION IN CERTAIN GREAT EUROPEAN CITIES.





1870, 1871, and 1872. Accurate numbers of the French loss from small-pox are wanting, but it is certain that this loss was very great.

Small-pox Deaths per 100,000 Population in the Years 1870-83.

(Compulsory Revaccination since 1874.)														
	1870.	1871.	1872.	1873.	1874.	1875.	1876.	1877.	1878.	1879.	1880.	1881.	1882.	1883.
Berlin	22	632	138	11	2.4	5.1	1.8	0.4	0.7	0.7	0.8	4.7	0.4	0.3
Hamburg	25	1075	95	0.8	0.5	0.0	1.8	1.2	0.2	0.0	0.0	2.2	0.4	0.0
Breslau	13	356	282	13	0.8	0.0	0.0	0.7	1.5	0.3	0.7	1.1	3.2	8.3
Munich	0.0	88	61	2.9	1.0	0.0	0.5	0.0	0.9	0.0	0.0	1.0	2.9	0.0
Dresden	9.0	360	85	13	4.3	2.5	0.5	0.9	0.0	1.8	3.6	2.6	1.3	0.8
London	30	242	53	3.5	1.6	1.3	20	70	38	12	12	61	11	3.4
Paris	546?	?	5.5	0.9	2.4	13	20	6.8	4.4	45	108.	49	29	20
Vienna	46	74	536	228	135	113	167	84	75	46	73	123	108	9.6
Petersburg	*	*	*	*	*	*	*	*	144	142	21	28	77	46
Prague	?	15	?	?	30	11	78	395	86	84	290	64	57	224

* Returns wanting.

“The German army suffered by far less than the French from small-pox, although in France it came continually into

contact with a population amongst which small-pox was rife. The *war in itself*, with its fatigues and deprivations, could not have caused the great increase in small-pox, for the Austrian army suffered still more.

"The only difference as regards the small-pox relations of the three armies is this, that whereas the Austrian and French armies, as must be acknowledged, were scantily re-vaccinated, and were amongst a population scantily revaccinated, and hence more permeated by small-pox: the German army, on the other hand, enjoyed the advantage of a carefully carried-out revaccination, and the relative protection afforded by a surrounding community almost free from small-pox.

"The evil influence of a community affected with small-pox, and the relative protection afforded by a surrounding free from this disease, is at once evident from the Table of small-pox sickness in the German army. For it must be allowed that revaccination had already been practised in the army for several decades, with a fair degree of carefulness. In spite of this, the small-pox cases in 1867-69—*i.e.*, before the general revaccination law—are more numerous than after 1874. No other explanation can be afforded for this, than that just as during the war small-pox in the German army considerably increased, in consequence of its coming into contact with small-pox in France, so the same thing must have happened in Germany itself before the war, when there was more small-pox amongst the civil population than there has been of late years.

"It is worthy of note that not a single death from small-pox has occurred in the Prussian army since 1874, whereas both the Austrian and French armies still show considerable losses in this respect. No other reason can be made to account for this striking difference than the effect of a rigidly conducted vaccination and revaccination."

The text which accompanies the Imperial Board of Health tables concludes in these words:

"In the above comparative Tables the principles of statistics have been rigidly adhered to. Collective populations are compared with collective populations, large cities with large cities, armies with armies. Moreover, the subjects of comparison are numerically so vast, that the errors which inevitably attend smaller figures are eliminated.

"The result most conclusively testifies to the beneficial effect of compulsory vaccination (*i.e.*, the German compulsory vaccination—*vide supra*, page 40).

"In *Germany as a whole*, small-pox has diminished to a

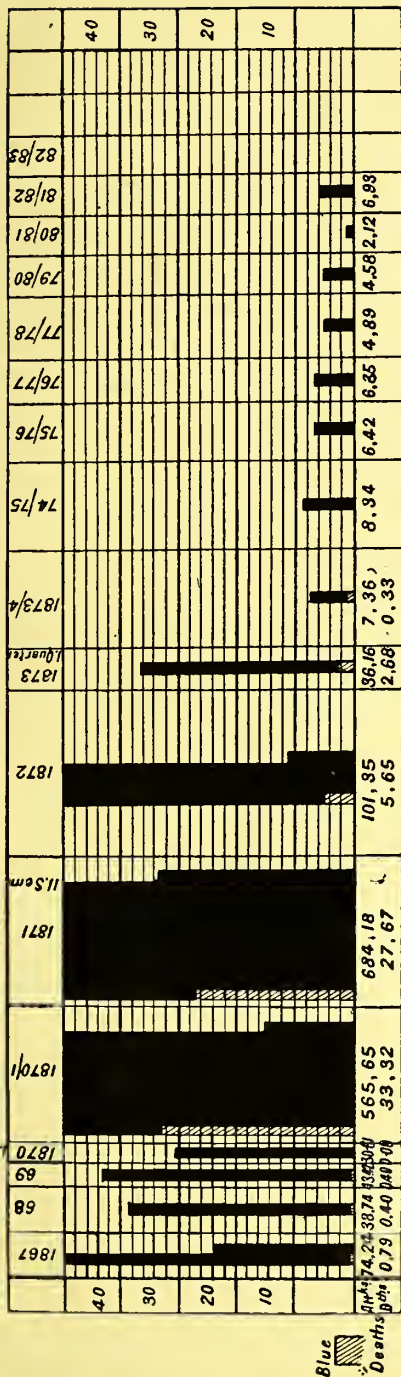
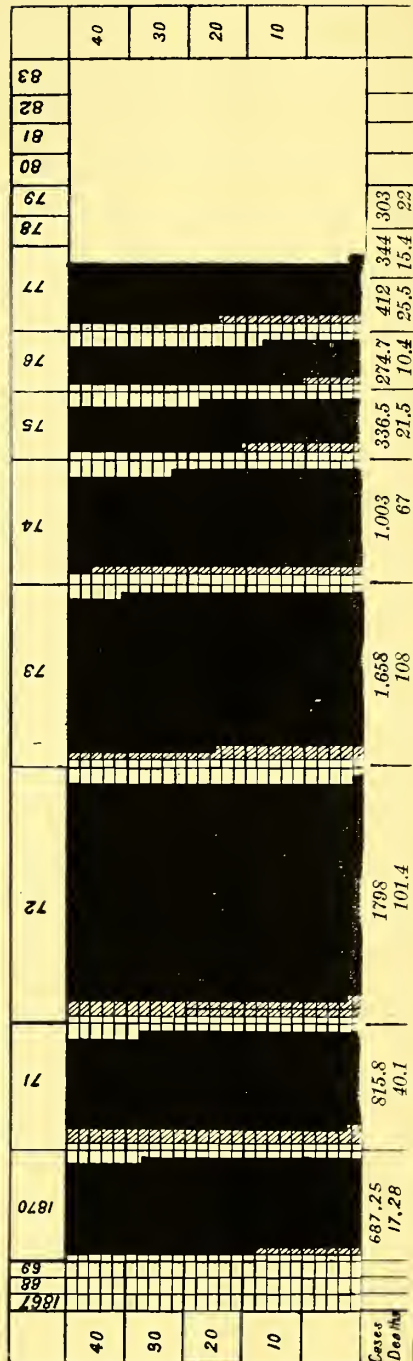
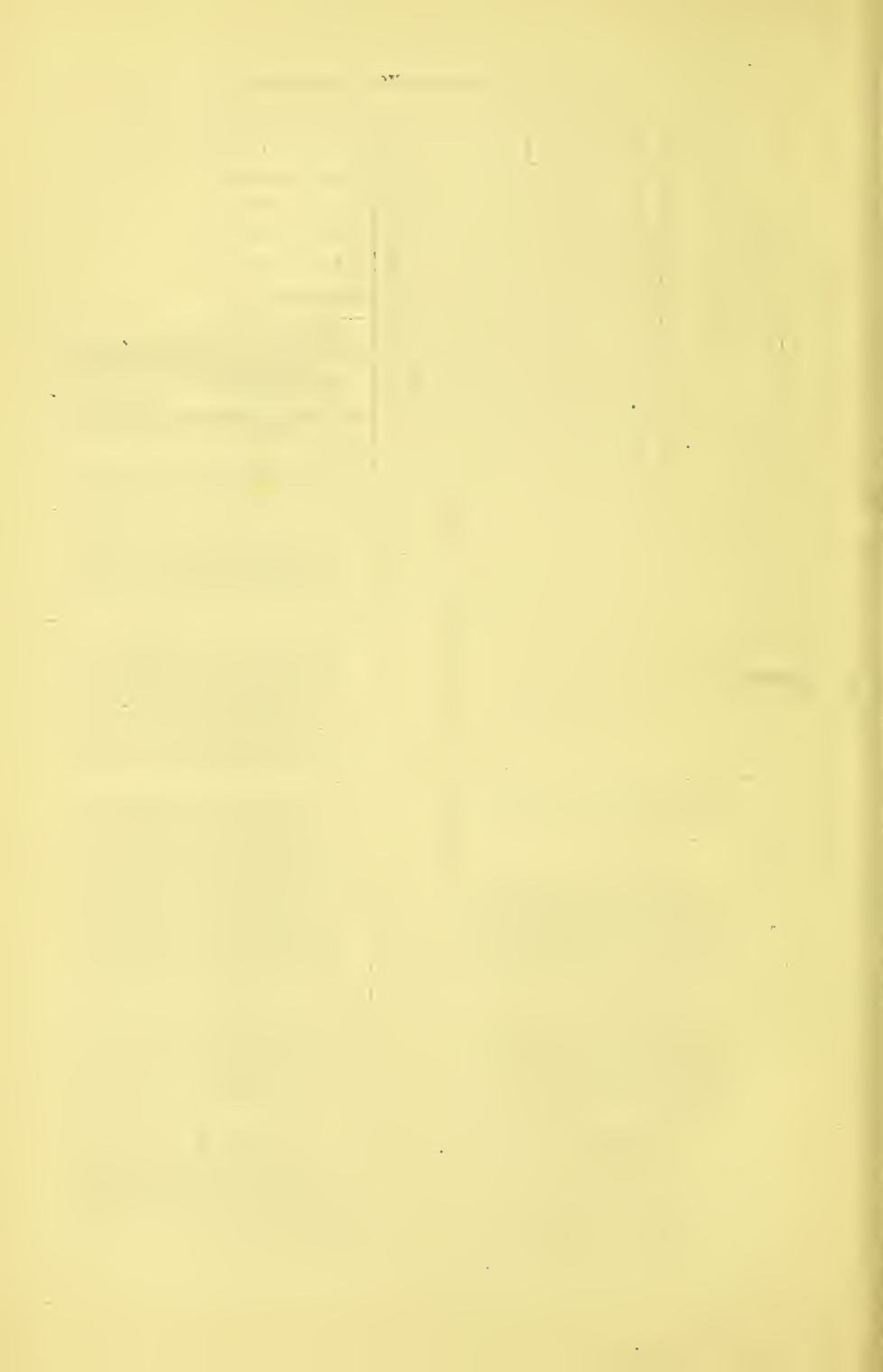


CHART IV.—AUSRIAN A Y.—SMALL-POX CASES AND DEATH PER 100,000.





Prussian (or German) Army.—Small-pox Cases and Deaths per 100,000 Men.

	1867.	1868.	1869.	1870. (1st half.)	1870-1.	1871. (2nd half.)	1872.	1873. (1st quarter.)	1873-4.	1874-5.	1875-6.	1876-7.	1877-8.	1878-9.	1879-80.	1880-1.	1881-2.	1882-3.
Cases	74	38	43	30	565	684	161	36	7.3	8.3	6.4	6.3	4.8	4.5	2.1	6.9	4.5	2.2
Deaths	0.8	0.4	0.4	0.0	33	27	5.6	2.6	0.3	—	—	—	—	—	—	—	—	—

Austrian, French, and British Armies.

	1867.	1868.	1869.	1870.	1871.	1872.	1873.	1874.	1875.	1876.	1877.	1878.	1879.	1880.	1881.	1882.
AUSTRIAN ARMY.																
Cases	?	?	?	687	815	1798	1658	1003	336	274	412	344	303	—	—	—
Deaths.....	?	?	?	17	40	101	108	67	21	10	25	15	22	—	—	—
FRENCH ARMY.																
Cases	231	633	372	?	?	60	27	39	141	230	222	213	115	153	111	—
Deaths.....	18	42	22	?	?	10	4	3	17	28	19	20	8.9	15	8	—
BRITISH ARMY.																
Cases	62	88	107	42	192	111	58	34	12	26	41	48	23	12	22	36
Deaths.....	3	2	11	6	23	17	8	5	2	1	3	8	2	2	2	3

degree never before known, so far back as any records reach. In all neighbouring countries small-pox is, as usual, still very prevalent.

"The *German large cities* suffer scarcely at all from small-pox, which continues to demand its victims in all large foreign cities.

"Lastly, the *German army* is almost free from small-pox, while other armies still suffer severely."

The Bavarian Statistics.

Von Kerchensteiner said that the presence of French prisoners had caused much small-pox. The statistics went back to 1803; Kolb himself was on their statistical commission. They had had very little small-pox, except during the war. The number of cases for 1871 was 30,742; of deaths, 4,748. Of the cases, 29,429 were vaccinated (95 per cent.). The proportion of cases to the population was only 0.68 per cent.; in former times it had been even 10 per cent. For the year 1872, he had age-classes by him. The mortality amongst the revaccinated was 5 per cent., amongst the vaccinated (once) 14 per cent., and amongst the unvaccinated 45 per cent. Of these last, at least seven-eighths were children under one year. Dr. Boeving argued that, assuming Klinger's estimate correct—viz., that 96 per cent. of the population were vaccinated—that left 200,000 unvaccinated, with only 47 cases amongst them, if only they left out all the children under one year; for amongst them the mortality was naturally very high, and most of them were unvaccinated. 790 unvaccinated cases died, and 734 of them were under one year. On the whole, the mortality for 1871 was 60 per cent. in the unvaccinated, 30 per cent. in the vaccinated, and 8 per cent. in the revaccinated. In reply, both Koch and Von Kerchensteiner fully allowed the influence of age; but they showed that the proportion of unvaccinated population was much less than 4 per cent., and that it would be more correct to take it at $\frac{1}{2}$ per cent., but it could not be accurately given; so that, even deducting those under one year, the deaths amongst the unvaccinated would still be far higher than amongst the vaccinated.

As to there being so many cases in such a well-vaccinated country as Bavaria, this was the very reason why they had introduced compulsory revaccination. It was seen that primary vaccination was quite insufficient, although it had been most carefully carried out in Bavaria.

Dr. Siegel's Leipzig Statistics.

An intense epidemic raged in and about Leipzig in 1870, 1871, and 1872. About 8 per cent. of the people had small-pox, and over 1 in 1,000 died. There had been an anti-vaccination agitation for some years before, so that in Leipzig they decreased from 3,400 vaccinations in 1868, to 1,300 in 1870; while in the villages round, before 1867 almost all the children were vaccinated, but in 1867 and 1868 only 60 to 70 per cent., in 1869 only 30 per cent., and in 1870 only 15 per cent. were vaccinated. (!) Then came the epidemic, and out of 200,000 people, 2,500 died.

When the epidemic was beginning, Dr. Siegel requested all the medical men to send him accurate returns of the cases every fortnight. The result was as follows, all the cases being *medically observed* and reported. There were, in all, 3,881 cases, with 721 deaths. Of these cases, 1,600 were children under 15, and amongst these 1,600,

1,350 were unvaccinated, with 488 deaths = 36 per cent.;

250 were vaccinated, with only 8 deaths = 3.2 per cent.

Of these eight, six were reported as having been successfully vaccinated; the other two were doubtful cases. The work had been arranged in age-classes, with analogous results.

It had been called a poor result, that 250 vaccinated children should have small-pox, and that eight should die; but then, the severity of the cases should be taken into consideration. The 250 cases were mostly extremely slight, as indeed the mortality showed; and the notes proved that many of the patients were hardly a day or two days in bed, and the slightest varioloids were included.

On the other hand, the heavy mortality of 488 amongst 1,350 unvaccinated—*i.e.*, nearly 40 per cent.—indicated a severe course of the disease in the vast majority of the cases.

Dr. Grossheim's Army Statistics (Prussia).

A. Before the war of 1870-71.

Rigid vaccination of every recruit was begun in 1834, and the small-pox deaths at once diminished. Before that date the deaths were as high as 108 in 1831, and the same number in 1833, while the lowest number was 12 in 1825; while from 1834 to 1869, the highest number in any year was 9; and the army small-pox mortality was also less than the civil.

B. Since the war.

"No army can show such a good result. . . . Compare

our deaths, viz., *two*, in ten years of peace, with the deaths in the French army in 1872 to 1880, viz., 588—more than all the cases in the Prussian army during the same ten years (376) The French cases are 5,586, giving a yearly average of 621. . . . As to the Austrians, in one year (1878) they had 1,114 cases and 50 deaths, . . . though no epidemic then occurred."

c. During the war.

The number of cases in the whole field army was 4,991, with only 297 deaths, a mortality of not quite six per cent. The vaccinated condition could not be given for all the cases, but it could be given in 1,005 cases, with 61 deaths. Of these 1,005 :—

Unvaccinated.....	=	4 cases with 1 death.	Mortality...	25
Successfully revaccinated ...	=	109 " " 2 deaths.	"	1.8
Unsuccessfully revaccinated ...	=	224 " " 10 "	"	4.5
Not revaccinated.....	=	531 " " 46 "	"	8.6
Revaccinated (result unknown)=	130	" " 1 "	"	0.7
Revaccinated (result doubtful)=	7	" " 0 "	"	—

They had hardly any small-pox in the army when they first went into France. Most of the cases occurred amongst contingents (especially the Saxony and Hesse), among whom revaccination had only recently been introduced (1868 and 1869, respectively). The Bavarian troops also suffered heavily from small-pox, partly because they were more exposed to it than the rest, and partly because their heavy losses in battle had to be made up by substitutes not so well revaccinated. In fact, the Bavarian War Minister issued an order that the fresh troops should all be revaccinated. Compare now the French prisoners in Germany with the immobilised army there:—French prisoners, 372,918; small-pox cases, 14,178; deaths, 1,963 (over 13 per cent.). Immobile army, 300,424; small-pox cases, 3,472; deaths, 162 (4.6 per cent.). As to the French field-army, the number of small-pox cases had been estimated as 23,469; but this number he could not verify. But in the Paris army alone, of 170,000 men there were 11,500 cases and 1,600 deaths.

Vaccination in the French army was very imperfectly done; and even in the years 1866-9, the small-pox deaths per 100,000 were 46, 17, 169, and 95. When they learnt from proper sources that only 59 per cent. of the French children were vaccinated; that the army surgeons repeatedly complained of the scanty vaccination even before the war; that several general orders were issued on the subject; that vaccination was not imperatively performed on every recruit, as in the German army, but only on those who had not had

small-pox already, or had not been previously vaccinated, they might be sure that the French army (including prisoners) was not under the same vaccination protection as the German army. Anthony had put down the successful army vaccinations in 1876-1880 at 50, 33, 59, 69, and 71 per cent. This was far behind the German vaccination, which in 1880 showed 106,264 successful vaccinations out of 122,000. Again, in 1869, there were 115,876 French recruits, while there were only 54,720 vaccinations that year, and the successes of these were only 34.25 per cent. The German successful vaccinations during the war were 70 per cent., though this was far behind their usual proportion. They were very short of lymph, and there was often no time for the necessary care and inspection.

The sanitary conditions had been said to be much worse, and the depressing influences greater, in the French army than in the German. But, apart from the fact that the Austrian army suffered so much in the same epidemic, if this were true, the French would have had more typhus and dysentery than the Germans, whereas it was otherwise. Small-pox was the least fatal of all the acute diseases in the German army. Out of 475,400 patients of the whole field-army, the cases from typhus were 154 per 1,000; dysentery, 81; ague, 14; and small-pox, 10. But in the Paris army, out of 77,231 deaths, 8,068 (or 104 per 1,000) were due to small-pox; 4,821 (or 62 per 1,000), to typhus; and 1,042 (or 13 per 1,000), to dysentery. Although deaths were here compared with cases, this was enough to prove his assertion.

Comparing the German army with the civil population of same age in Berlin, the deaths per 10,000 in the latter were 20, in the former only 2.4. (!)

Koch added that the Langres garrison, near which he was himself attached to a lazaretto for two months, were only locked up for a few weeks, yet in seven months out of 15,000 men they lost 334 by small-pox (22 per cent.), while the Metz garrison, out of ten times the number of men lost only 176 (11 per cent.). Now, the Metz troops belonged to the regular army, and were better vaccinated than the Langres troops, which consisted of *gardes mobiles* and *gardes nationales*.

Having now finished with the most important of the statistics, I will say a word on the law of 1874. It is said by the anti-vaccinationists that Prussia had compulsory revaccination already long before 1874. This is ridiculous. I will make two quotations respecting this, one from Dr. Boeing

(an opponent of compulsory vaccination), the other from Dr. Koch. Dr. Boeig says, on page 39 of the Report: "Before 1874 we had no Vaccination Law in Prussia therefore the influence of *revaccination*, which we have first from 1875."

Dr. Koch says, on p. 46: "The same thing is seen when we compare the mortality statistics of one and the same country—e.g., Prussia—before and after the introduction of compulsory vaccination by the Vaccination Law of 1874." And again, on p. 34: "The object of the Tables is to illustrate the effect of the Vaccination Law of 1874; and I may presuppose that with every reader, when compulsory vaccination is spoken of, that compulsion is to be understood which is prescribed by that German vaccination law—that is, the compulsion to vaccination and revaccination."

So much for Prussia. As regards Bavaria, Von Kerchensteiner says (p. 95): "It has been said that in Bavaria, in spite of vaccination—I mean by this simple vaccination up to the year 1874, from thence onwards vaccination in Herr Geheimrath Koch's sense of the word....."

It is true that a few isolated towns or even districts may already have had revaccination; indeed, I find that in the Jaxt district in South Germany the school children had been revaccinated just before leaving school, for thirty years previously. But the revaccinated people formed an infinitesimal portion of the population before 1875.

Query 2: What is the duration of the protection afforded by vaccination?

On this subject the Commission agreed that it was impossible to fix an exact duration for everyone, but some definite period had to be given, for the sake of legislative enactments. They were almost unanimous that vaccination should be repeated soon after early childhood, and the age of ten years was chosen, as giving time for repetition of vaccination, if required, before the children left school. Koch's own opinion was, that in about half the population, protection had already ceased in about ten years after primary vaccination. In Posen, he had had about 50 per cent. of successful revaccinations in children aged ten years; but some people were undoubtedly protected for life by revaccination. He himself was an instance, so far.

Elless had pointed out that the protective influence of vaccination against small-pox often outlasted the insusceptibility to revaccination. People had been successfully vaccinated even after small-pox itself, just as small-pox occasionally attacked the same individual a second time.

It is interesting to read that here Koch rejoiced to find that both Drs. Boeing and Weber acknowledged a certain degree of immunity from small-pox after vaccination, though this was inconsistent with their voting in the two previous conclusions. Boeing replied that he was a public vaccinator himself, and not an "anti-vaccinator", and he had never denied a certain degree of protection after vaccination. Dr. Weber's immunity was in reality a tolerance, like the arsenic eater's. This was easily shown to be a misplaced analogy; the arsenic-eater did not confine himself to one heroic dose of arsenic, nor was the vaccine virus imparted in minute doses. Dr. Betz radically opposed vaccination.

Query 4: What relation subsists between vaccination-protection and the number of vesicles?

Dr. Koch enumerated the Stockwell Hospital statistics, showing in patients with no vaccination-marks the mortality was nearly 50 per cent., while the presence of even one good cicatrix lowered it to 5 per cent. With four or more marks, the mortality was only 1 per cent. The investigations of Oppert, of Hamburg, supported this. Eulenburg thought that three vesicles should be the minimum, at a good distance from each other. Kranz had some figures to show. In München, 1,000 children aged twelve had been revaccinated alike, with six punctures on each arm. The success depended on the number of primary cicatrices. Of those with one cicatrix, 278 were successfully revaccinated; with two, 200; with three, 252; with four, 82; with more, 68, 65, and 38; with twelve, 31. Thus there was a lowering from 278 to 31, inversely, according to the number of primary cicatrices. Burchardt had examined 10,436 men in the army. Of these, with no cicatrix, 76.7 were successfully revaccinated; with between one and ten marks, 70.3 per cent.; with ten, 63.8 per cent. He did not think the number made much difference. In the army, revaccination was still called successful if one vesicle developed. Koch moved for at least two vesicles as the minimum of success, for there might be a doubt about one alone. Feiler had found that children with only one mark could be revaccinated at six years of age, but that with three or four marks, nearly every revaccination failed. Siegel inclined to three. On the other hand, Jenner and the first vaccinators were satisfied with one good vesicle, and proved perfect protection after it, at least for a time, by unsuccessful inoculation of small-pox virus. Reissner, after revaccinating 6,000 children, had found the number of cicatrices make a distinct difference in the successfulness. Eulenburg thought that the organism was much more sus-

ceptible to vaccination than to variola. As to what should be done when only one vesicle had developed, he would say, perform auto-revaccination on the seventh day from that vesicle. In Holland this was done regularly, if less than ten vesicles were present. Siegel supported this, and had done so since 1880, in Leipsig. Von Koch's motion for a general expression that the protection increased with the number of vesicles, was lost by 8 votes against 5, and Dr. Koch's motion for two vesicles as the minimum was carried by 12 against 3.

Query 5: At what age is revaccination necessary?

This question involved no discussion, after the debate on the third question.

Query 6: Does the vaccinated condition of the community increase the relative protection against small-pox, which the individual has acquired by vaccination; and is vaccination thus beneficial not only of individual, but general use.

Koch explained that the protection afforded after vaccination and revaccination was by no means absolute, and, according to their experience, an absolute protection of the population would never be attained. Hence the importance to the individual of keeping his surrounding as free as possible from small-pox. The strongest support for this view was found in the army tables; for the law of 1874 made no difference in the vaccination of the army, and yet small-pox had remarkably declined directly afterwards. Moreover, their charts showed them that small-pox in Germany now only infested the frontiers, especially the Austrian frontier, where small-pox was still very prevalent. It was therefore the right and the duty of the State to require all its citizens to be vaccinated, that the partial protection of the individual might be supplemented by a general protection. It was said by some, "Let those who like be revaccinated, but do not compel everybody." This was not just. It would only be just to argue thus if the individual acquired absolute protection by vaccination. As to isolation of small-pox patients as an alternative measure, he would ask whether such isolation as would be required to vanquish an epidemic would not be a compulsory measure a hundred-fold and a thousand-fold more an infraction of the personal liberty of the people, and would not cause a thousand-fold more resistance, than the incomparably milder measure of compulsory vaccination and revaccination in childhood? But even the most rigid isolation would not keep the disease away from them; and Siegel pointed out that it would necessarily always be too late. Regarding disinfection of patients and their belongings,

it was condemned as both impracticable and useless. The conclusion was voted by 12 against 1; 2 abstaining.

Query 7: Is vaccination attended by danger to the health? Of what kind is this danger (if any), and what is its extent?

This gave rise to a most interesting discussion. Koch's original motion ran thus—"Under certain circumstances, vaccination is attended with danger." This he withdrew at first in favour of Thierfelder's—"Under special circumstances", etc. Von Kerchensteiner preferred Koch's motion as being more general—we could not as yet accurately define the special circumstances. Koch's motion was then reinstated. Vaccination, Koch allowed, was essentially a disease, but not practically such. Grossheim said that no dyscrasiæ had attended the army vaccinations. In 1882, returns were asked for from all the army surgeons; and these returns showed that out of 1,200,000 revaccinations, decided indispositions occurred after only 78, and one man had died (of "blood-poisoning"). Thus, only six out of every 100,000 were sick, if they assumed the returns to go back ten years; but many went back much further. Granted that the temperature usually rose after vaccination on the fifth, sixth, or seventh day, sometimes to 40° C. (104° F.), this was, as a rule, for only a few hours; and there were whole series of cases with lower temperatures. But to call vaccination "a disease" would simply mislead the public. They would require to fix first the pathological signification of the word "disease"—a toothache, or an ingrowing toe-nail, was a disease, properly speaking. Probably no one in Berlin at that moment was ideally healthy. The medical was different from the popular acceptation of the word. Boeving desired that vaccination should be called a disease in all cases. Eventually the Commission resolved that vaccination in itself was not attended with danger; at the most, there was only a temporary febrile condition, and any danger was due to accidental complications. No one voted against this conclusion.

Then came the next part of the question—Of what kind and extent is the danger?

Syphilis (said Koch) came first, as the best known, though it did not deserve to stand in the foreground. He was not aware that any death after vaccination had ever been established as being due to transferred syphilis; in the isolated cases that occurred it was a curable disease, that generally was cured. The exact number of transferences he could not give. Quite a number of cases had been recorded that had been found to be erroneous on investigation; perhaps others, really syphilitic, had not come to their knowledge. He thought

it would suffice to say that syphilis had been transferred by vaccination, that the number of cases was extremely small, and that the danger might be entirely avoided by the use of animal lymph. Practically speaking, the only other danger was *erysipelas*; any cases of "*blood-poisoning*" were primarily erysipelatous. As to any other diseases, all they could say was, that other diseases might possibly be imparted; *e.g.*, there was the theoretical possibility that tuberculosis might be transferred, though no such case had ever yet been established. Vague expressions as to *scrofula* were often used, by anti-vaccinators especially; but they all knew that the incubation-stage was here so long that it would be quite impossible to establish its connection with vaccination. There existed abundant opportunities for children to be infected by the virus of so extensive a disease as tuberculosis (if liable to it?—E. J. E.). No other diseases needed any mention. As to vaccination-erysipelas, there was an "early" and a "late" erysipelas. The former alone was due to the lymph itself. They had now learnt to experiment with the micro-organism causing it, and how to avoid the disease by proper treatment of the lymph. Only syphilis and erysipelas therefore needed mention in their answer. Bad wounds might be made by bad treatment of the vesicles, and all sorts of things were applied by the parents. Hence sometimes, ulcers, eczema, lymphatic gland swellings, etc. Eulenburg said, that as to the Oedt epidemic of small-pox itself after vaccination, Professor Strohl, of Strassburg, had clearly shown that the affected children were already infected by small-pox, and were vaccinated in its incubation-stage. Von Kerchensteiner declared that the "*post hoc, ergo propter hoc*" argument was never so outrageously applied as by anti-vaccinators. The Commission agreed that as yet we only know of syphilis and "early erysipelas" as being transferable, but it was thought best to use the wider expression, "accidental wound-diseases", instead of the latter. The conclusion was thus voted by 12 votes, 3 abstaining.

Query 8: Have any particular diseases, or has the general mortality, increased since the introduction of vaccination?

Some diseases, especially *scrofula*, had been said to have increased since vaccination was introduced, but neither medical literature nor individual experience gave any warrant for this. Boeving agreed with Koch, but desired to insert the words "scientifically provable". Weber also acknowledged that Vogts' statistics from England had not the desired scientific evidence, though they had been sufficient to draw attention to the subject. The well-known English

Parliamentary Return was brought forward by him, showing an increase of skin diseases, scrofula and syphilis, in periods corresponding with the sharpening of the Vaccination Law, while the general mortality had declined. Weber laid weight on the increase of scrofula, but confessed that as to syphilis the causes of its increase were too numerous to allow of any particular conclusion being drawn. This was very mild opposition from two opponents of compulsory vaccination. Reissner accounted for the alleged increase by, in the first place, the cultivation of the statistical sense of late years amongst the profession; and secondly, by a more physiological tendency than formerly. Thierfelder pointed out that, since so many more lives were saved by vaccination, there was more scope for the attacks of general diseases. He could not see any connection between vaccination and the alleged increase of syphilis; and as to scrofula, a connection could only be assumed upon suppositions no longer tenable. He did not attach much importance to the English table. Grossheim said that their minute army statistics gave no support to the idea of any increase of disease as a result of vaccination. Returns from 1873 to 1882 showed a steady decrease of all diseases, as also of the general mortality and the incapacities to serve in the army. Krieger relied on a statistic from Alsace-Lorraine, reaching from 1564 to 1877 (see vol. x of *Statistical Reports of Alsace-Lorraine*), which showed a decided reduction of mortality on the introduction of vaccination. The births had not increased, but the deaths had decreased. Eulenburg referred to Swedish statistics from 1715 to 1795, and again, after the introduction of vaccination, from 1825 to 1840 and thence to 1850—the deaths being given for every five years of life. A decline of mortality was shown in each period after vaccination began, except in the period from one to five years of age, when the mortality was stationary. Krieger showed that the average yearly mortality in Strasburg had sunk from 37 per 1,000 last century, to between 32 and 33 in the present century. Koeh's very open answer was then voted, as modified by Boeig. This ended the first series of conclusions.

In regard to the second series, "On the Introduction of Animal Lymph", an interesting memorandum on the subject had been drawn up in the Imperial Board of Health Office for the use of the Commission, and this summed up succinctly the advantages and disadvantages of human and animal lymph respectively. The substance of this has already been given to a great extent in Koeh's remarks on the dangers attending vaccination. It was shown that there never could

be any danger of transferring syphilis with calf-lymph, even if the calf had been vaccinated with syphilitic lymph, because the syphilitic virus could not exist outside the human body for longer than a very short time, certainly not above a day or two. (Human lymph, preserved in tubes or on points, must, therefore, be equally safe, in my opinion.) The Commission were reminded, moreover, that all human lymph contains blood, even the clearest lymph, as might be seen by examining a drop under the microscope. As to "perlsucht" (or bovine tuberculosis), nothing was rarer in young calves, even the intra-uterine "perlsucht."

The advantages of human lymph were:—certainty of effect; simpler operation; costlessness.

The disadvantages of human lymph were:—the proved danger of syphilis and erysipelas; the possibility of tuberculosis; and the difficulty of obtaining enough, in epidemic periods especially.

The advantages of calf-lymph were:—security against syphilis; security against "early erysipelas" by antiseptic methods; advantages of vast supply, viz., uniformity of quality and easy subjection to test-inoculation; great simplification of vaccinator's work.

The disadvantages of calf-lymph were:—somewhat less certainty of effect; a rather more complicated operation required with it; much greater cost.

It was estimated that every vaccination would cost one-twentieth of a shilling; but as every vaccination already cost one shilling, this did not make much difference. Arnsperger, Von Koch, and Von Kerchensteiner, all thought that the methods of preserving animal lymph were not yet sufficiently perfect, and desired the Commission to express a preference for calf-lymph, without using any obligatory terms. But Koch pleaded for his motion, which he said was not to be taken to mean that only animal lymph was to be used henceforth,—as, indeed, the next resolution would show. Grossheim said the army could not do without human lymph during wars and epidemics.

Pfeiffer was quoted (one of the highest authorities on the subject), as saying that he decidedly preferred calf-lymph to human. But Pfeiffer had only just published the following: "The true cow-pox virus, the retro-vaccine virus (calf-lymph, after vaccination of calves with human lymph), and human vaccine lymph are all equivalent in certainty of effect, course, and protective power. But animal lymph quite excluded syphilis, which, however, was equally excluded in human lymph also by the exercise of ordinary care.

Accordingly, no essential preference can be bestowed on animal lymph."

Again, Freund, of Breslau, (1879) had collected all the known cases of transferences of syphilis,—viz., 52 reported transferences and 510 reported cases of infection—out of many millions of vaccinations. He concluded that in 25 of the transferences they could easily have been avoided, while in 17 more the data for forming an opinion on this point were not forthcoming.

It appears that calf-lymph is already largely used in Germany, in some places exclusively, as the maps which I produce show. In 1882 the following vaccinations took place—the lymph is specified:—

Population (1880) = 45,234,061.

A.—PRIMARY VACCINATION.—Number for vaccination, after deductions, 1,338,464. Of these, vaccinated successfully, 1,158,696 (86.5 per cent.); unsuccessfully, 31,441 (2.3 per cent.); unknown, 5,773.

Origin of Lymph.—Number vaccinated with human lymph, 1,103,462 (91.4 per cent.); calf-lymph, 91,941 (76.4 per cent.); arm-to-arm, 532,242; uncertain, 11,834.

B.—REVACCINATIONS. — Number for examination, after deductions, 1,068,830. Of these, vaccinated successfully, 898,601 (84 per cent.); unsuccessfully, 119,972 (11.2 per cent.); unknown, 6,147.

Origin of Lymph.—Number vaccinated with human lymph, 954,915 (93 per cent.); calf-lymph, 66,514 (6.5 per cent.); uncertain, 3,291. Successful primary vaccinations, 95.9 per cent. Successful revaccinations, 87.7 per cent.

Von Conta moved, that neither kind deserves special preference. Boeig moved for the words, "at least as regards syphilis," in place of the words, "syphilis, erysipelas, etc." Boeig and Reissner strongly desired calf-lymph. Koch moved to insert the words, "(so far as a direct transference of syphilis is concerned)". Arnsperger moved to the effect that the substitution of calf-lymph was to be striven after. Von Kerchensteiner moved, "that vaccination with calf-lymph *can* replace the use of human lymph"—(Koch's expression was, "has to replace"). Boeig withdrew his motion on Koch's insertion of the word "direct". Thierfelder's motion ran like Koch's, but left out the words in parenthesis, and substituted "will be avoided" (for "*can*, etc."). Von Kerchensteiner withdrew his in favour of Grossheim's, "the substitution. . . is recommended." Upon voting, Von Conta's motion was rejected by 13 against 2:

Thierfelder's, by 12 against 1, 2 abstaining; and Koch's motion was accepted by 11 against 2, 2 abstaining.

Ninth Series (a national small-pox statistic).—Several members of the Commission begged for a sickness- as well as a death-statistic, but Koch argued strongly against it, for reasons which I have anticipated in a previous page. The Imperial statistic of small-pox must have a basis as absolutely secure as could be got, and even a mortality statistic required careful verification. The separate States were at liberty to make their own sickness-statistics. Boeing's motion for the latter also was therefore rejected by 11 against 5, and Koch's was accepted without voting.

In the discussion on the yearly returns of the population, divided into age-classes of ten years for each sex, Boeing begged for the separate insertion of the age-class below one year; but Von Scheel, of the Statistical Department, explained that any lower division than ten years would leave more room for error, and would materially assist in making verification difficult. Eventually, Boeing's motion was only lost by eight against eight—which seems to be a pity, considering the importance of the influence of age in this subject.

In conclusion, I must observe that a truly scientific spirit seems to have animated the Commission as a body. In the first place, the "vaccinated condition" was rejected as being too unreliable for statistics, though it might be useful (Dr. Koch said) on subsidiary points, and if only thoroughly and absolutely reliable, would be the most valuable basis of a small-pox statistic. Again, the statistics, especially those of the Imperial Board of Health, are based on sound principles. Half-a-dozen towns are not separated from all the rest, and compared with isolated portions of the general population. And lastly, the subject of any attendant dangers in vaccination was discussed exhaustively, and yet most temperately; and here the German opponents of compulsory vaccination deserve credit. They did not pull out from the National Statistics any special disease which may happen to have increased during the last forty years, and rashly assert its connection, or even bring it into juxtaposition, with vaccination—as if I were to argue that vaccination causes diarrhœa, because I find in the Registrar-General's Return that diarrhœa has increased considerably since the introduction of vaccination.

By the kindness of Prof. Koch, I have just learnt that the small-pox deaths per 100,000 in Berlin, in 1883, were 0.33; in 1884, 1.6; in Prussia, in 1883, 1.9; in Bavaria, in 1883, 0.6; in 1884, 0.15.

ERRATA.

Chart 1.—In 1882 the Death-rate was 3.64.

„ 2.—In 1871 the Death-rate was 39.28 ; in 1877, 53.18, *not* 16.94 ;
in 1878, 60.59, *not* 5.57 ; in 1881, 82.67, *not* 78.80.

„ 3.—In 1872 the Attacks were 161.35, *not* 181.35.

„ 4.—In 1880 the Death-rate in Paris was 108.91, *not* 103.91.

In 1871 the Death-rate in Hamburg was 1075, *not* 1875.

29.5.00
H.C.

